ELECTRO-OPTIC TECHNOLOGY DIVISION
SPECIAL OPERATIONS BRANCH (JXQR)

PERFORMANCE SPECIFICATION FOR IMPROVED NIGHT/DAY FIRE CONTROL/OBSERVATION DEVICE – BLOCK 3

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1. SCOPE

This performance specification covers the Improved Night/Day Fire Control/Observation Device, Block III.

1.1 Background

This acquisition is designated an evolutionary acquisition utilizing a best value approach. This acquisition is a follow-on to the original materiel solution for the Improved Night/Day Fire Control/Observation Device (INOD) (AN/PVS-19), the Universal Night Sight (AN/PVS-22) – INOD Block I, and the Universal Night Sight – Long Range (AN/PVS-26) – INOD Block II. The approach is to meet the requirements of the Capabilities Development Document (CDD) for the Improved Night/Day Fire Control/Observation Device (INOD) Increment 3 in achieving a true all weather, all-condition, low light/no light capability for Special Operations Forces (SOF) snipers. The INOD-Block III is to provide improved capability over the existing AN/PVS-26.

1.2 Mission Area

The INOD-BLOCK III systems will be utilized throughout the spectrum of SOF operational continuum, from Humanitarian Assistance and Peacekeeping, through Counter-terrorism and Counterinsurgency, to low intensity conflict and full-scale war. The mission areas will range from villages in the third world to highly developed urbanized areas. The environmental conditions will range from tropic to arctic with weather conditions associated with these environments. The INOD Evolutionary Acquisition program addresses the needs of SOF snipers to acquire, conduct surveillance, and engage targets with small arms during periods of daylight/night time or limited visibility in all terrain types.

2. APPLICABLE DOCUMENTS

2.1 Government documents

Capabilities Development Document (CDD) for the Improved Night/Day Fire Control/Observation Device (INOD) Increment 3 dated August 2011

2.2 Military Standards

MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment (10 December 2007)
MIL-STD-810G	Environmental Test Methods and Engineering Guidelines

(31 October 2008)

MIL-STD-130N Identification Marking of U.S. Military Property (17 December 2007)

MIL-STD-1913 Notice 1 Dimensioning of Accessory Mounting Rail for Small Arms Weapons (20 April 2004)

2.3 Non-Government Standards

ANSI/ASQ/ISO Q9001-2008 Quality Management Systems – Requirements

2.4 Other Publications

Joint Publication 1-02, Department of Defense (DoD) Dictionary of Military and Associated Terms (12 April 2001 as Amended through 19 June 2009)

DA-PAM 350-38 Standards in Weapons Training STRAC Manual Chapter 5, Infantry Weapons Systems (13 May 2009)

Boettcher, Leonard, Hodgkin, Hixson, Miller, Johnson, Thompson, Godbolt and Acton. (2010) New Target Acquisition Task for Contemporary Operating Environments: Personnel in MWIR, LWIR and SWIR. *Proceedings of SPIE* Vol.7662

3. REQUIREMENTS

3.1 Requirement Definitions

3.1.1 Thresholds/Objectives

Performance parameters and features in this specification are assigned numerical or verbal values. In some instances, assigned or Objective (O) requirements that exceed the minimum requirements of this specification are listed in conjunction with the minimum or Threshold (T) requirements. In these instances, the threshold and objective parameters will be annotated as such. In the event no (T) or (O) value is assigned, the implied value will be a (T) parameter. Objective values may also be identified without a Threshold value, in which case the Threshold is not applicable.

3.1.2 Nomenclature

The use of the term, INOD, INOD-Block III (3), Improved Night Observation Device or Sight, unless otherwise stated, refers only to the configuration of the device specified within this document and not to other versions of INOD.

3.1.3 Requirements

3.1.3.1 Configuration The INOD-Block III shall be an inline, clip-on device that mounts in front of an existing SOF dayscope.

3.1.3.2 Interoperability with SOF Weapon Systems The INOD system's centerline shall be optimized for compatibility with all SOF weapon systems. Optical centerline from top of MIL-STD-1913 rail shall be 1.5 (+/- .02) inches. The INOD shall be non-interfering with the operation of the host weapon system including dayscope.

3.1.3.3 Weight The INOD shall weigh less than 4 lbs (T), 1.5 lbs (O). The weight shall include the system, batteries, and mounts.

3.1.3.4 Engagement Range The INOD will allow SOF snipers to successfully engage enemy combatants under all lighting conditions at 800 meters (T), 2000 meters (O). Engagement range is the range at which a trained sniper can detect, acquire and put rounds on the target (i.e. enemy combatant) and does not imply specific detection, recognition or identification requirements, which are identified separately.

3.1.3.5 Covert Operation The INOD system will allow the SOF Snipers to operate in an Active (T) or Passive (O) covert mode. Covert modes can utilize an active component including active illumination technology. The use of an active source is acceptable when the ability to detect the source has not been widely proliferated. All covert operating modes must also meet other detectability requirements. (Low observables).

3.1.3.6 Compatibility with Protective Gear The INOD switches and controls shall be functional while wearing Flyer's Summer Gloves (NSN 415-01-029-0113).

3.2 Major Components

The INOD-BLOCK III shall be a weapon mountable in line clip-on thermal sight for use on SOF Sniper rifles. The INOD-BLOCK III shall contain the following Major Components:

a) Sight with attached adjustable locking throw lever mounting bracket
b) Detachable connecting hoods/couplers for night sight to dayscope connection
c) Operators/Maintenance Manual with Quick Reference Card with each delivered system
d) Batteries
e) Daylight/Lens Cover with lanyard
f) Lens Cleaning Kit
g) Soft Carrying Case
h) Interface Cable(s) (Video, Power, Remote Control)
i) Remote Control

3.3 Physical Characteristics

3.3.1 Mounting Bracket The Sight shall include an adjustable locking throw lever mounting system to allow for single hand operation and attachment/mounting on MIL-STD-1913 rails using no tools. The Mounting Bracket shall be designed to reduce potential snag hazards in the field and shall not damage the weapon rail. (T) The sight should allow the mount base to be adjusted (i.e. spacers) to ensure proper alignment with dayscopes outside the 1.5" height above rail requirement (O).

3.3.2 Daylight/Lens Cover A daylight/lens cover shall be provided for protection of the objective lens in the daytime. It shall remain attached to the Sight and in closed position when not in use. It shall remain locked in the open position during live fire operations and shall not close due to recoil shock or overpressure from the weapon (T). The daylight/lens cover shall provide impact protection, e.g. drop protection for the objective lens housing (O).

3.3.3 Coupling Device The Sight shall include a soft coupling device to block light leakage and dust intrusion at the interface between the dayscope objective lens and in line clip-on sight configuration for 40mm, 50mm, and 56mm dayscope objective lenses.

3.3.4 Lens Cleaning Kit The lens cleaning kit shall consist of at least a lens cleaning paper booklet, soft bristle brush and shall fit within the soft carrying case.

3.3.5 Soft Carrying Case The Sight shall have a padded soft carrying case that provides space and protection for the components listed in paragraph 3.2. The case shall be made of nylon with closed cell foam padding. It shall also have attachments for web belt and pack mounting and a FASTEX style clip (T).

3.3.6 Surfaces External surfaces (except for light transmitting elements) shall be finished in a neutral flat color that is non-reflective and corrosion resistant. The external lens and eyepiece shall not be obscured by condensation. The Sight shall have corrosion resistant and scratch resistant coatings on all exposed optics, which permit operation in salt sprays and blowing sand. All internal surfaces (except light transmitting elements) that are exposed to light from external and internal sources shall be finished to achieve the lowest feasible light reflectance (T).

3.3.7 Adjustments and Controls All controls shall be located on the Sight. These controls shall include power-on/off, auto/manual gain, polarity, non-uniformity correction, and focus. The controls shall permit fingertip control throughout the range of the operational environment and shall be operable by either hand and shall not cause the operator to lose visibility of the sight picture while adjusting. The design shall reflect the need for operation by soldiers wearing cold weather and/or level IV Mission Oriented Protective Posture (MOPP) clothing. Controls shall maintain position throughout system use in the operational environment. The sight shall have a focus knob to control system focus from near focus to past infinity, which shall be visibly noted by a defocused image. Sufficient tension shall exist to prevent accidental movement of the focus knob. Controls and adjustments shall include a simple and intuitive operator control and adjustment schema (T).

3.3.8 Switches The INOD switches shall be recessed and/or protected from inadvertent operations and damage. Controls shall exhibit tactile geometries that allow the operator to feel and discriminate between different switches in the dark. (Reference 3.1.3.6)

3.3.9 Compass/Rangefinder The INOD will include an integrated compass to provide the user with heading information with accuracy no more than +/- 10 degrees (T), +/- 3 degrees (O). The INOD shall include an integrated eye-safe laser rangefinder capable of ranging a man-sized target out to 2,000 meters with an accuracy of +/- 5 meters (O).

3.3.10 Input/Output Interface The INOD shall have the ability to interface to external power sources, remote controls, and output video to external devices (T). The INOD shall have an interface to accept Laser Rangefinder and other sniper related data inputs (O).

3.3.11 Remote Control The INOD shall have a remote control which allows the Operator to remotely control the INOD System without breaching position from the host weapon. The remote control shall have a keypad which replicates all functional system controls with the exception of manual focus and Power ON/OFF/Standby features. The body of the remote control dimensions shall not exceed 3.25" (L) x 2.0" (W) x 0.6" (H) and shall have a cable length of 42" min to 44" max. The remote control keypad shall be oriented such that the remote control keypad and system keypad (when mounted to a weapon) face the same direction where the cable attaches to the remote control. The remote control shall have a flat back surface which allows for the adaptation of 2-way Velcro and shall be included with each remote as a deliverable.

3.4 Performance Characteristics

3.4.1 Sensor Performance

3.4.1.1 Enemy Combatant Classification The INOD shall allow the SOF Sniper to detect and distinguish the following at ranges out to 800 meters: (1) man vs. an animal; (2) man standing vs. man high crawling; (3) man holding a weapon vs. man not holding a weapon. (T) The INOD shall allow the SOF Sniper to detect and distinguish the following at ranges out to 2000 meters: (1) man vs. an animal; (2) man standing vs. man high crawling; (3) man holding a weapon vs. man not holding a weapon. (O) Range requirements are defined as having a 0.70 probability of classification for the TTP criteria and conditions defined in Section 5.

3.4.1.2 Environmental Observations The INOD shall be able to determine wind speed and direction under all lighting conditions at ranges of 500 meters (T), 1000 meters (O) by observing wind effects on tree branches, tall grass, blowing leaves and other ground debris.

3.4.1.3 Bullet Trace Observation The INOD shall allow SOF Snipers to observe bullet trace out to 800 meters under all lighting conditions and observing the bullet path from SOF sniper weapons using standard ammunition (T).

3.4.2 Power Requirements

3.4.2.1 Start-Up Time The INOD, at an ambient temperature of 23°C (± 2°C), shall have an initial power-up time less than or equal to 5 minutes (T), 1 minute (O). Power-up from standby shall not exceed 5 seconds (T), 1 second (O).

3.4.2.2 Operating Time The INOD-BLOCK III shall have an internal battery compartment that will house the primary batteries and enable continuous operation of the system in normal operating mode for a minimum of 6 hours (T) and 12 hours (O). The system shall be capable of being powered externally by a BA5590 battery (T). To extend the operational life, a single “hot swap” battery option is allowed in order to meet the Threshold and/or Objective requirements. The single “hot swap” will allow replacement of battery(s) while in weapon mounted position and remaining fully operational.

3.4.2.3 Batteries The INOD shall use standard, commercial batteries including but not limited to, “AA,” "AA Lithium" or “CR123” (T) or both CR123 and “AA” batteries (O). The batteries shall be easily replaced/installed in the field by the operator with one hand, without using tools, and without removing the sight from the weapon. The Sight shall have battery polarity indicators and reverse polarity protection (T) or be capable of operating regardless of the battery orientation (O).

3.4.2.4 Other Battery/Power Features The On/Off switch shall be labeled and contain positive verification of the ON and OFF locations (T) and also have a power save mode (O). The Sight shall have the ability to run from an external power source. The battery lid shall be connected to the body of the sight to prevent loss. The Sight shall contain a visible low battery indicator within the system field of view (T).

3.4.3 Security The INOD, while fully operating, shall not emit noise or light that is detectable by the human ear/eye or a GEN II/III night vision device in any direction at a distance beyond five meters (T). A detachable lens hood or similar glare reduction device shall be included (T).

3.4.4 Dayscope Interoperability The INOD shall be optimized for use with SOF Sniper Dayscopes set at 15X magnification (T), or optimized for use with Dayscopes ranging from 5X to 25X variable magnification (O). Representative Dayscopes include but are not limited to the Schmidt and Bender 5-25x56mm PMII, the Nightforce 3.5-15x50mm, the Nightforce 5.5-22x56mm, and the Leupold 6-20x50mm.

3.4.5 Accuracy The Sight shall allow a trained sniper to maintain his current level of accuracy (T), and deliver precise fire within one minute of angle (1 MOA) (O). Any Sight placed on the weapon shall not degrade the shooters current level of accuracy. If a weapon is good to within 1 MOA accuracy, then even with all other factors, environment, shooter, ammo, etc., taken into account, the shooter shall be able to maintain that level of accuracy or whatever accuracy he can attain with his current scope.

3.4.6 Repeatability The Sight shall not lose more than 0.5 MOA of accuracy when repeatedly dismounted from the weapon and remounted (T) or shall have no loss of zero when remounted (O).

3.4.7 Waterproof/Immersion The Sight shall be waterproof down to 3 feet of water for 2 hours without a waterproof bag (T). The Sight shall be waterproof and pressure resistant down to 66 feet of seawater (29.4 psig) for 2 hours without a waterproof bag (O).

3.4.8 Atmospheric Pressure The INOD shall be transportable and function effectively without degradation at altitudes up to 30,000 feet above sea level (T).

3.4.9 Climatic Design The Sight shall be able to operate at temperatures between -20 to +50 degrees Celsius (-4 to +120 degrees Fahrenheit) and withstand storage and transit at temperatures ranging from -20 to +60 degrees Celsius (T).

3.4.10 Salt Fog All external surfaces shall be rust and salt water corrosion resistant (T) when subjected to a 5% saltwater solution for 48 hours followed by a 48-hour drying period.

3.4.11 Mobility and Transportability The Sight shall not be damaged by most military methods of transport/infiltration to include HMMWV, cargo aircraft, helicopters, static line airborne operations, Fast Boats, and Submersible Diving Vehicles (SDVs) (T).

3.4.12 Compatibility The cheekweld, sight picture, and eye relief shall not change with use of the INOD by the operator while wearing various uniforms, equipment, and possibly eyeglasses appropriate for each individual mission. The shooting position shall be the same as current fielded rifles.

3.4.13 Reliability The Sight shall have a 90% probability of operating 36 hours on a 3-day mission without failure (T). The Sight shall have a 90% probability of operating 48 hours on a 4-day mission (O). The Sight shall be tested (and required to survive) in typical operational scenarios to include boat transit and airborne (free fall and static line) operations in a soft case (on weapon or individually).

3.4.14 Survivability and Detectability The Sight shall have the ability to attach removable laser protection and optical detection countermeasures (O).

3.4.15 Blemishes and Image Defects The central viewing areas of the Sight when viewed through a 15x dayscope, shall have no more than two (2) blemishes, image defects, or dead pixels that subtend 0.2 milliradian or greater within the central to upper viewing area (0.5 degrees of the central upper scene). The Sight shall have no blemishes, image defects, or dead pixels that subtend 0.2 milliradian or greater within the central lower viewing area (0.5 degrees of the central lower scene).

3.4.16 Weapons Shock The Sight in its operational configuration, shall not be damaged nor exhibit any degradation in performance from muzzle flash and/or recoil shock when subjected to five groups of five rounds each on the .50 caliber sniper rifles (MK15 and M107), the .300 WinMag caliber MK13, MK20, and the PSR (Model TBD). The Sight in its operational configuration, shall not be damaged nor exhibit any degradation in performance when subjected to 300 rounds of equivalent

shock from any of the host weapons listed in 3.4.17. Equivalent shock is equal to an average peak acceleration height of 4000g's for a mean duration of 1 millisecond half sine wave.

3.4.17 Host Weapon Mounting The INOD-BLOCK III shall mount to and align to standard rail systems (e.g. MIL-STD1913 i.e. Picatinny Rail) and be compatible with the MK13, MK15, MK20, M110, M2010, M24, M107, PSR (Model TBD) and other sniper rifles and rounds commonly used by SOF.

3.4.18 Electromagnetic Interference The INOD performance shall not be affected by electromagnetic emissions from battlefield electronic devices operating within 3 meters of the system, nor experience performance degradation when subjected to the electric fields outlined in Table 1. Per MIL-STD-461F, all referenced field strengths are measured at the device under test.

Table 1 – EMI Requirements

Frequency Range (MHz)	*RMS Field Strength (V/M)*	*Polarity*
2 - 30	50	Vertical
30 - 200	50	Vertical + Horizontal
200 - 1000	100	Vertical + Horizontal

3.5 Workmanship The INOD optical components shall not contain foreign matter—such as dust, dirt, fingerprints, or moisture—that can be detected by visual examination. Joints and seams shall be a tight fit, and electrical wiring shall be secure and without unbroken insulation. All assemblies shall be free from cracks, splits, cold flow, shrinkage, inclusions, porosity, or any similar characteristics. Threads shall be full and undamaged for the entire length or depth. All moving parts shall be examined to insure that they move freely throughout their entire range without sticking, binding, or creeping.

4. NOTES

4.1 Technical Interpretations and Key Definitions

The following technical interpretations and key definitions are, when referenced in sections 3 or 4, mandatory for this specification.

4.1.1 Damage

Damage is defined as:

a) Electrical failure or malfunctioning intermittent or continuous including arcing, corona, flashing, bright spots, flickering, or blinking.

b) Cracks, breakage, deformation, corrosion, or deterioration of any part or finish, and missing or loose components.
c) Degradation of image quality including ion noise, dark spots, or shading.

4.1.2 Degradation of Performance Degradation of performance is defined as the diminishment of any performance parameter to a level below the specified acceptable limit, including but not limited to reliability, maintainability, safety, accuracy, and static performance characteristics such as seals, optical coatings, and the condition of materials (brittleness of plastics, weakened seals or deformed plastics).

4.1.3 Ambient Temperature Ambient temperature is defined as + 73 degrees with tolerances of +18 and –3.6 degrees Fahrenheit (+23 degrees Celsius with tolerances of +10 degrees Celsius and –2 degrees Celsius).

4.1.4 Hot Swap A "hot swap" is inserting or removing a component/battery of a device while it is operating without losing power or functionality of the system.

4.1.5 Targeting Task Performance (TTP) Metric The V50 data for different wavebands is shown in Table 2 and should be utilized for modeling data.

Table 2 – Targeting Task Performance

Waveband	**Human Activity (Critical Dimension = .75m)**			**Weapon Recognition - V50 (Critical Dimension = .25m)**		
	V50	**ΔT or Contrast**	**Task Set Size**	**V50**	**ΔT or Contrast**	**Task Set Size**
MWIR - LWIR	7.5	3 deg	24	5	2 deg	12
VIS-SWIR	6	40% target 20% background	24	2	40% target 20% background	12

4.1.6 Modeling Parameters
The criteria utilized in modeling and simulation is defined using the parameters in Table 3.

Table 3 – Modeling Parameters

Background Temperature	300˚K(26.85˚C)
Reflective Targets:	40% Reflectivity; 20% Background Reflectivity
IR Contrast	3° C (Human Activity) 2° C (Weapon Recognition)
Atmosphere:	Beer's Law: 0.9 per km transmittance (t).

Ambient Light Source(Night) w/ Standard Spectral Profile	Starlight, Full Moon, Quarter Moon
* All inputs will utilize standard values where applicable	